L 12

```
   SSSSSSSSSSSS  YYY         YYY     SSSSSSSSSSSS
   SSSSSSSSSSSS  YYY         YYY     SSSSSSSSSSSS
   SSSSSSSSSSSS  YYY         YYY     SSSSSSSSSSSS
SSS              YYY         YYY  SSS
SSS              YYY         YYY  SSS
SSS              YYY         YYY  SSS
SSS                 YYY   YYY     SSS
SSS                 YYY   YYY     SSS
SSS                 YYY   YYY     SSS
   SSSSSSSSS           YYY           SSSSSSSSS
   SSSSSSSSS           YYY           SSSSSSSSS
   SSSSSSSSS           YYY           SSSSSSSSS
            SSS        YYY                    SSS
            SSS        YYY                    SSS
            SSS        YYY                    SSS
            SSS        YYY                    SSS
            SSS        YYY                    SSS
            SSS        YYY                    SSS
SSSSSSSSSSSS           YYY        SSSSSSSSSSSS
SSSSSSSSSSSS           YYY        SSSSSSSSSSSS
SSSSSSSSSSSS           YYY        SSSSSSSSSSSS
```

```
_$

Ps
--
YZ

Z$

Z$

Z$


Z$


Z$






Z$

Z$

Z$

Z$

Z$

Z$


Z$
```

H 16

```
**FILE**ID**SYSIMGFIX
```

```
  SSSSSSSS  YY      YY    SSSSSSSS    IIIIII    MM      MM    GGGGGGGG  FFFFFFFFFF    IIIIII    XX      XX
  SSSSSSSS  YY      YY    SSSSSSSS    IIIIII    MM      MM    GGGGGGGG  FFFFFFFFFF    IIIIII    XX      XX
SS          YY      YY  SS              II      MMMM  MMMM  GG          FF              II      XX      XX
SS          YY      YY  SS              II      MMMM  MMMM  GG          FF              II      XX      XX
SS            YY  YY    SS              II      MM  MM  MM  GG          FF              II        XX  XX
SS            YY  YY    SS              II      MM  MM  MM  GG          FF              II        XX  XX
  SSSSSS        YY        SSSSSS        II      MM      MM  GG          FFFFFFFF        II          XX
  SSSSSS        YY        SSSSSS        II      MM      MM  GG          FFFFFFFF        II          XX
        SS      YY              SS      II      MM      MM  GG  GGGGGG  FF              II        XX  XX
        SS      YY              SS      II      MM      MM  GG  GGGGGG  FF              II        XX  XX
        SS      YY              SS      II      MM      MM  GG      GG  FF              II      XX      XX      ....
        SS      YY              SS      II      MM      MM  GG      GG  FF              II      XX      XX      ....
SSSSSSSS        YY      SSSSSSSS      IIIIII    MM      MM    GGGGGG    FF            IIIIII    XX      XX      ....
SSSSSSSS        YY      SSSSSSSS      IIIIII    MM      MM    GGGGGG    FF            IIIIII    XX      XX      ....

LL            IIIIII      SSSSSSSS
LL            IIIIII      SSSSSSSS
LL              II      SS
LL              II      SS
LL              II      SS
LL              II      SS
LL              II        SSSSSS
LL              II        SSSSSS
LL              II              SS
LL              II              SS
LL              II              SS
LL              II              SS
LLLLLLLLLL    IIIIII    SSSSSSSS
LLLLLLLLLL    IIIIII    SSSSSSSS
```

Table of contents

```
0000          .TITLE  SYS$IMGFIX - Address Fixup System Service
0000          .IDENT  'V04-000'
0000    ;
0000    ;****************************************************************************
0000    ;*                                                                          *
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0000    ;*                                                                          *
0000    ;*                                                                          *
0000    ;****************************************************************************
0000
0000    ;++
0000    ; Facility:
0000    ;
0000    ;       Executive - Image Activator Completion Routines
0000    ;
0000    ; Abstract:
0000    ;
0000    ;       This module contains subroutines used by the image activator
0000    ;       to perform address relocation after images have been activated.
0000    ;
0000    ; Environment:
0000    ;
0000    ;       Most of the code in this module runs in user mode but some routines
0000    ;       may also be called from exec mode.
0000    ;
0000          .SUBTITLE       History
0000    ;
0000    ; Author:
0000    ;
0000    ;       Lawrence J. Kenah
0000    ;
0000    ; Creation Date:
0000    ;
0000    ;       19 March 198
0000    ;
0000    ; Modified by:
0000    ;
0000    ;       V03-010 LJK0279         Lawrence J. Kenah       8-May-1984
0000    ;               Miscellaneous cleanup. Remove temporary definition of
0000    ;               SHL$B_SHL_SIZE. Put all code into YF$$SYSIMGACT program
0000    ;               section.
```

```
0000    ;
0000    ;       V03-009 LJK0270         Lawrence J. Kenah       31-Mar-1984
0000    ;               Add code to call shareable image initialization routines.
0000    ;
0000    ;       V03-008 LJK0275         Lawrence J. Kenah       25-Mar-1984
0000    ;               The size of SHL elements is variable. It depends on when
0000    ;               the image was linked.
0000    ;
0000    ;       V03-007 LJK0238         Lawrence J. Kenah       26-Jul-1983
0000    ;               Use new concept of image base address instead of first address
0000    ;               into which image is mapped.
0000    ;
0000    ;       V03-006 LJK0218         Lawrence J. Kenah       28-Jun-1983
0000    ;               Minor cleanup.
0000    ;
0000    ;       V03-005 LJK0200         Lawrence J. Kenah       14-Jun-1983
0000    ;               Make changes that support new image activator
0000    ;
0000    ;               Base addresses of shareable images are now located by searching
0000    ;               the ICB list, a much simpler list than the master fixup vector
0000    ;               list. Routine COPY_SHL is no longer needed. All code that
0000    ;               existed to support a previous design for mapping shareable
0000    ;               images permanently into P1 space is also eliminated. Use
0000    ;               IMG$ prefix for global entry point names. Eliminate prefix
0000    ;               from routines that are local.
0000    ;
0000    ;       V03-004 LJK0195         Lawrence J. Kenah       9-Mar-1983
0000    ;               Make so-called recursive activation capable of activating
0000    ;               more than one image without dropping some fixups on the floor.
0000    ;
0000    ;       V03-003 LJK0192         Lawrence J. Kenah       7-Jan-1983
0000    ;               Do poor man's recursive activation to support shareable
0000    ;               images that reference other shareable images not known
0000    ;               to the image header of the executable image.
0000    ;
0000    ;       V03-002 MLJ0099         Martin L. Jack, 20-Oct-1982  19:40
0000    ;               Fix broken BSBWs.
0000    ;
0000    ;       V03-001 KDM0002         Kathleen D. Morse       28-Jun-1982
0000    ;               Added $SSDEF.
0000    ;
0000    ;--
```

```
0000              .SUBTITLE     Declarations
0000
0000      ; Include Files:
0000
0000              $IACDEF                               ; Image activator control flags
0000              $IAFDEF                               ; Offsets into image activator fixup
0000                                                    ;  area within image file
0000              $ICBDEF                               ; Image control block offsets
0000              $IMAGCTXDEF                           ; Context of currently executing image
0000              $IMGDEF                               ; Image activator status codes
0000              $PSLDEF                               ; PSL field definitions and constants
0000              $SETPRTDEF                            ; Argument list offsets for $SETPRT system service
0000              $SHLDEF                               ; Offsets into shareable image list element
```

```
                      0000          .SBTTL  EXE$IMGFIX      Address Relocation Fixup System Service
                      0000  ;+
                      0000  ; Functional Description:
                      0000  ;
                      0000  ;       This procedure is called after an image is activated but before it
                      0000  ;       is called in order to allow address fixups to be performed in user
                      0000  ;       access mode if the caller of the image so wishes. This prevents
                      0000  ;       process destruction os security breaches if the image that has just
                      0000  ;       been activated contains garbage or selected cleverness.
                      0000  ;
                      0000  ; Calling Sequence:
                      0000  ;
                      0000  ;       CALLS   #0,EXE$IMGFIX
                      0000  ;
                      0000  ; Implicit Input:
                      0000  ;
                      0000  ;       Address space of image just activated that contains fixup vectors
                      0000  ;       that describe the address fixups that must be done.
                      0000  ;
                      0000  ; Implicit Output:
                      0000  ;
                      0000  ;       All appropriate locations are relocated to reflect the locations
                      0000  ;       of each shareable image during this activation of the image.
                      0000  ;
                      0000  ; Completion Codes:
                      0000  ;
                      0000  ;       R0 low bit set => successful completion (SS$_NORMAL)
                      0000  ;
                      0000  ;       R0 low bit clear => error occurred
                      0000  ;
                      0000  ;               Actual error status codes are returned by GET_BASE_ADDRESSES and
                      0000  ;               PROCESS_FIXUP_LIST.
                      0000  ;
                      0000  ; Side Effects:
                      0000  ;
                      0000  ;       See the routine headers for the two functional routines for a
                      0000  ;       description of the effects of this procedure.
                      0000  ;-
                      0000
                      0000  ; Put all of this module into a separate pageable program section
                      0000
                  00000000          .PSECT  YF$$SYSIMGACT
                      0000
                      0000  EXE$IMGFIX::
              003C    0000          .WORD   ^M<R2,R3,R4,R5>          ; Save some registers
         35     10    0002          BSBB    GET_BASE_ADDRESSES       ; Get base address of each image
      26 50     E9    0004          BLBC    R0,10$                   ; Skip hard part if an error occurred
       00AC     30    0007          BSBW    PROCESS_FIXUP_LIST       ; Do the actual relocation
         10     E1    000A          BBC     #IMAGCTX$V_SETVECTOR,-
1B 00000000'GF        000C                  G^IAC$GL_IMAGCTX,10$     ; Any vectors to set?
                      0012          $IMGACT_S       0,0,0,-
                      0012                  IMGCTL=#IAC$M_SETVECTOR ; Let image activator set them
         11     E1    002D  10$:    BBC     #IMAGCTX$V_INITIALIZE,-
03 00000000'GF        002F                  G^IAC$GL_IMAGCTX,20$     ; Any routines to be called?
       0189     30    0035          BSBW    INISHRIMG                ; Find them and call them
                04    0038  20$:    RET                              ; Return with final status
```

```
                                0039   172          .SBTTL  GET_BASE_ADDRESSES - Locate Each Shareable Image
                                0039   173  ;+
                                0039   174  ; Functional Description:
                                0039   175  ;
                                0039   176  ;       This routine is called before the actual fixup operations are performed
                                0039   177  ;       to determine the base address of each shareable image that has been
                                0039   178  ;       mapped. If a shareable image in the fixup list has no corresponding
                                0039   179  ;       entry of the same name in the master ICB list, an error is reported.
                                0039   180  ;
                                0039   181  ;       Note that the image activator has filled in the base address for SHL
                                0039   182  ;       entry 0, the SHL associated with the image itself.
                                0039   183  ;
                                0039   184  ; Calling Sequence:
                                0039   185  ;
                                0039   186  ;       JSB     GET_BASE_ADDRESSES
                                0039   187  ;
                                0039   188  ; Input Parameters:
                                0039   189  ;
                                0039   190  ;       none
                                0039   191  ;
                                0039   192  ; Implicit Input:
                                0039   193  ;
                                0039   194  ;       Listheads for fixup vector list and ICB list
                                0039   195  ;
                                0039   196  ; Output Parameters:
                                0039   197  ;
                                0039   198  ;       none
                                0039   199  ;
                                0039   200  ; Implicit Output:
                                0039   201  ;
                                0039   202  ;       All SHL entries in the linked list of fixup vectors have base addresses
                                0039   203  ;       of their associated shareable images stored in SHL$L_BASEVA.
                                0039   204  ;
                                0039   205  ; Completion Codes:
                                0039   206  ;
                                0039   207  ;       R0 = SS$_NORMAL
                                0039   208  ;
                                0039   209  ;               All base addresses were successfully stored.
                                0039   210  ;
                                0039   211  ;       R0 = IMG$_IMAGE_NOT_FOUND
                                0039   212  ;
                                0039   213  ;               A shareable image name in a SHL entry had no corresponding
                                0039   214  ;               ICB. This means that the shareable image was not mapped,
                                0039   215  ;               which indicates an inconsistency between SHL entries and
                                0039   216  ;               image section descriptors in the image header of one of the
                                0039   217  ;               images that was mapped.
                                0039   218  ;
                                0039   219  ; Side Effects:
                                0039   220  ;
                                0039   221  ;       R0 and R1 are destroyed
                                0039   222  ;-
                                0039   223
                                0039   224  GET_BASE_ADDRESSES:
       55    FFFFFFFC'GF    DE  0039   225          MOVAL   G^<CTL$GL_FIXUPLNK-IAF$L_FIXUPLNK>,R5 ; Pick up listhead address
                                0040   226
          55    04 A5    D0  0040   227  10$:    MOVL    IAF$L_FIXUPLNK(R5),R5   ; Get address of next fixup vector
                   27    13  0044   228          BEQL    30$                     ; Return success if done
```

```
        52    1C A5   D0  0046              MOVL    IAF$L_SHRIMGCNT(R5),R2  ; Count of SHL entries to R2
                 F4   13  004A              BEQL    10$                      ; None here. Get next fixup vector
   53    18 A5    55  C1  004C              ADDL3   R5,IAF$L_SHLSTOFF(R5),R3 ; Address of first SHL entry to R3
   54    10 A3        9A  0051              MOVZBL  SHL$B_SHL_SIZE(R3),R4    ; Get size of each SHL element
                          0055
                          0055      ; By jumping into the middle of the loop, we are in effect skipping over
                          0055      ; entry 0, whose base address was stored by the image activator when the
                          0055      ; image was mapped.
                          0055
                 0E   11  0055              BRB     25$
                          0057
        50    18 A3   9E  0057      20$:    MOVAB   SHL$T_IMGNAM(R3),R0      ; Pass shareable image name in R0
              0015    30  005B              BSBW    IMG$IS_IT_MAPPED         ; Find associated SHL entry in ICB LIST
              11 50   E9  005E              BLBC    R0,40$                   ; Quit if error occurred
        63    5C A1   D0  0061              MOVL    ICB$L_BASE_ADDRESS(R1),SHL$L_BASEVA(R3)
                          0065                                               ; Store base address
           53    54   C0  0065      25$:    ADDL2   R4,R3                    ; Point to next SHL entry
              EC 52   F5  0068              SOBGTR  R2, 20$                  ;  and do next entry
                          006B
                 D3   11  006B              BRB     10$                      ; Go back and get next fixup vector
                          006D
     50    0000'8F    3C  006D      30$:    MOVZWL  #SS$_NORMAL,R0           ; Indicate success to caller
                      05  0072      40$:    RSB                              ;  and return
```

```
                         0073         .SUBTITLE       IMG$IS_IT_MAPPED - Search ICB List for Shareable Image
                         0073  ;+
                         0073  ; Functional Description:
                         0073  ;
                         0073  ;       This routine searches the shareable image list associated with the
                         0073  ;       executable image to determine whether a shareable image with a given
                         0073  ;       name exists in the list. This routine is used to determine whether a
                         0073  ;       shareable image has already been mapped. Is is also used to relate the
                         0073  ;       relative shareable image list within a shareable image to the shareable
                         0073  ;       image list associated with the executable image.
                         0073  ;
                         0073  ; Calling Sequence:
                         0073  ;
                         0073  ;       JSB     IMG$IS_IT_MAPPED
                         0073  ;
                         0073  ; Input Parameters:
                         0073  ;
                         0073  ;       R0 = address of counted (ASCIC) string of shareable image name
                         0073  ;
                         0073  ; Implicit Input:
                         0073  ;
                         0073  ;       IAC$GL_IMAGE_LIST - Doubly linked list of ICBs describing images
                         0073  ;               that have already been mapped
                         0073  ;
                         0073  ; Output Parameters:
                         0073  ;
                         0073  ;       If successful, R1 contains the address of the image control block
                         0073  ;       that describes the named image.
                         0073  ;
                         0073  ; Completion Codes:
                         0073  ;
                         0073  ;       R0 low bit set indicates success (SS$_NORMAL)
                         0073  ;
                         0073  ;       R0 low bit clear indicates failure (IMG$_IMAGE_NOT_FOUND)
                         0073  ;
                         0073  ;               This status indicates that no match occurred, implying that
                         0073  ;               the shareable image in question has not yet been mapped.
                         0073  ;
                         0073  ;               The severity of this status depends on the caller. This routine
                         0073  ;               is called by the image activator to determine whether an image
                         0073  ;               has been mapped. If the image name is not found, then the image
                         0073  ;               activator maps the image. If this routine returns this status
                         0073  ;               to the fixup code located earlier in this module, that is a
                         0073  ;               fatal error indicating an inconsistence between shareable image
                         0073  ;               lists inside fixup vectors and ISD lists in image headers.
                         0073  ;-
                         0073
                         0073  IMG$IS_IT_MAPPED::
          00FC 8F    BB  0073         PUSHR   #^M<R2,R3,R4,R5,R6,R7>  ; Save some registers
            54 80    9A  0077         MOVZBL  (R0)+,R4                ; Save character count in R4
            55 50    D0  007A         MOVL    R0,R5                   ; Save string address in R5
                         007D
                         007D         ASSUME  ICB$L_FLINK EQ 0
                         007D
   57  00000000'GF   DE  007D         MOVAL   G^IAC$GL_IMAGE_LIST,R7  ; Get address of ICB listhead
            56 57    D0  0084         MOVL    R7,R6                   ; Copy it to a working register
                         0087
```

```
SYS
VAX

Pha
---
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219
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713
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Mac
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TOT

329

The

MAC
```

```
          56    66  D0  0087  10$:   MOVL    ICB$L_FLINK(R6),R6        ; Get address of next ICB
          57    56  D1  008A         CMPL    R6,R7                     ; Check for end of list
                1C  13  008D         BEQL    30$                       ; Equality indicates no more ICBs
                        008F
       14 A6    54  91  008F         CMPB    R4,ICB$T_IMAGE_NAME(R6)   ; Do string sizes agree?
                F2  12  0093         BNEQ    10$                       ; No, go get next ICB
  15 A6   65    54  29  0095         CMPC3   R4,(R5),ICB$T_IMAGE_NAME+1(R6)  ; Check strings for equality
                EB  12  009A         BNEQ    10$                       ; Go get next ICB if no match
          51    56  D0  009C         MOVL    R6,R1                     ; Store ICB address
                        009F
50    00000000'8F   D0  009F         MOVL    #SS$_NORMAL,R0            ; Indicate success to caller
          00FC  8F  BA  00A6  20$:   POPR    #^M<R2,R3,R4,R5,R6,R7>    ; Restore registers
                    05  00AA         RSB                               ;  and return
                        00AB
                        00AB  ; If we loop through the entire ICB list without matching the image name, then
                        00AB  ; the shareable image has not yet been mapped. Indicate that to caller.
                        00AB
50    084D8962 8F   D0  00AB  30$:   MOVL    #IMG$_IMAGE_NOT_FOUND,R0
                51  D4  00B2         CLRL    R1
                F0  11  00B4         BRB     20$
```

```
                         00B6          .SBTTL  PROCESS_FIXUP_LIST - Perform Post-Activation Fixups
                         00B6   ;+
                         00B6   ; Functional Description:
                         00B6   ;
                         00B6   ;       This routine processes a linked list of fixup vectors and performs
                         00B6   ;       the specific fixup operations listed in each vector. There are three
                         00B6   ;       forms of fixup.
                         00B6   ;
                         00B6   ;               o  Each exit vector has the base address of the shareable
                         00B6   ;                  image added to each entry.
                         00B6   ;
                         00B6   ;               o  Each .ADDRESS directive has the base address of the
                         00B6   ;                  appropriate shareable image added to it.
                         00B6   ;
                         00B6   ;               o  The protection of each fixup vector is changed to prevent
                         00B6   ;                  its being written when the image executes.
                         00B6   ;
                         00B6   ; Calling Sequence:
                         00B6   ;
                         00B6   ;       JSB     PROCESS_FIXUP_LIST
                         00B6   ;
                         00B6   ; Input Parameters:
                         00B6   ;
                         00B6   ;       none
                         00B6   ;
                         00B6   ; Implicit Input:
                         00B6   ;
                         00B6   ;       CTL$GL_FIXUPLNK         Listhead of linked list of fixup vectors for
                         00B6   ;                               a set of shareable images
                         00B6   ;
                         00B6   ; Output Parameters:
                         00B6   ;
                         00B6   ;       none
                         00B6   ;
                         00B6   ; Implicit Output:
                         00B6   ;
                         00B6   ;       Elements in fixup vector G-hat offset area have base address
                         00B6   ;       of appropriate shareable image added to them.
                         00B6   ;
                         00B6   ;       .ADDRESS directives throughout the address space have base
                         00B6   ;       addresses added in.
                         00B6   ;
                         00B6   ;       Pages that should eventually be read-only but were set to
                         00B6   ;       writable while the image activator works are set back to read-only.
                         00B6   ;
                         00B6   ; Completion Codes:
                         00B6   ;
                         00B6   ;       none
                         00B6   ;
                         00B6   ; Side Effects:
                         00B6   ;
                         00B6   ;       CTL$GL_FIXUPLNK cleared after fixups are completed.
                         00B6   ;
                         00B6   ;--
                         00B6
                         00B6   PROCESS_FIXUP_LIST:
  55   FFFFFFFC'GF   DE  00B6           MOVAL   G^<CTL$GL_FIXUPLNK-IAF$L_FIXUPLNK>,R5 ; Pick up listhead address
```

```
                   00BD    388
 55   04 A5    D0  00BD    389 10$:     MOVL    IAF$L_FIXUPLNK(R5),R5       ; Get address of next fixup vector
         2E    13  00C1    390          BEQL    40$                         ; Quit if no more to process
         51    D4  00C3    391          CLRL    R1                          ; Need base address of this shareable
       0042    30  00C5    392          BSBW    SHIMG_BASVA                 ;  image (with index 0)
      53 51    D0  00C8    393          MOVL    R1,R3                       ; Load correct input register
 54   0C A5    D0  00CB    394          MOVL    IAF$L_G_FIXOFF(R5),R4       ; Get offset to G-hat fixup data
         06    13  00CF    395          BEQL    20$                         ; Skip this step if none
      54 55    C0  00D1    396          ADDL2   R5,R4                       ; Make an address
       001B    30  00D4    397          BSBW    FIXUP_G_HAT                 ; Go do the actual work
 54   10 A5    D0  00D7    398 20$:     MOVL    IAF$L_DOTADROFF(R5),R4      ; Get offset to .ADDRESS fixup data
         06    13  00DB    399          BEQL    30$                         ; Skip this step if none
      54 55    C0  00DD    400          ADDL2   R5,R4                       ; Make an address
       0039    30  00E0    401          BSBW    FIXUP_ADDRESS               ; Fixup all .ADDRESS data
 54   14 A5    D0  00E3    402 30$:     MOVL    IAF$L_CHGPRTOFF(R5),R4      ; Get offset to page protection data
         D4    13  00E7    403          BEQL    10$                         ; Skip this step if none
      54 55    C0  00E9    404          ADDL2   R5,R4                       ; Make an address
       0049    30  00EC    405          BSBW    FIXUP_PROT                  ; Change page protection
         CC    11  00EF    406          BRB     10$                         ; All done with this fixup vector
                   00F1    407                                              ;  See if there are any more
               05  00F1    408 40$:     RSB                                 ; Return to caller
```

```
                          00F2          .SBTTL  FIXUP_G_HAT     Fixup G-hat exit vector
                          00F2  ;+
                          00F2  ; Functional Description:
                          00F2  ;
                          00F2  ;       This routine performs the G-hat fixup for a specific exit vector.
                          00F2  ;       specifically, the base address of the appropriate shareable image
                          00F2  ;       is added to each entry in the exit vector.
                          00F2  ;
                          00F2  ; Calling Sequence:
                          00F2  ;
                          00F2  ;       BSBW    FIXUP_G_HAT
                          00F2  ;
                          00F2  ; Input Parameters:
                          00F2  ;
                          00F2  ;       R4 = Address of G-hat fixup area within fixup vector
                          00F2  ;
                          00F2  ; Implicit Input:
                          00F2  ;
                          00F2  ;       Contents of G-hat fixup area
                          00F2  ;
                          00F2  ; Output Parameters:
                          00F2  ;
                          00F2  ;       none
                          00F2  ;
                          00F2  ; Implicit Output:
                          00F2  ;
                          00F2  ;       Elements in fixup vector G-hat offset area have base address
                          00F2  ;         of appropriate shareable image added to them.
                          00F2  ;
                          00F2  ; Completion Codes:
                          00F2  ;
                          00F2  ;       none
                          00F2  ;
                          00F2  ; Side Effects:
                          00F2  ;
                          00F2  ;       R0, R1, and R2 are destroyed
                          00F2  ;-
                          00F2
                          00F2  FIXUP_G_HAT:
          52    84    D0  00F2          MOVL    (R4)+,R2                ; R2 contains a count of fixups
                OD    13  00F5          BEQL    20$                     ; A zero indicates the end of the G-hat data
          51    84    D0  00F7          MOVL    (R4)+,R1                ; Store shareable image number in R1
                OE    10  00FA          BSBB    SHIMG_BASVA             ;  and then load R1 with base address
                          00FC                                          ;  of next shareable image.
          84    51    C0  00FC  10$:    ADDL2   R1,(R4)+                ; Bias next exit vector entry
             FA 52    F5  00FF          SOBGTR  R2,10$                  ; Do next entry
                EE    11  0102          BRB     FIXUP_G_HAT             ; Now do next shareable image
                          0104
 50   0000'8F         3C  0104  20$:    MOVZWL  #SS$_NORMAL,R0          ; Indicate success
                      05  0109          RSB                             ; Return
```

```
                              010A          .SBTTL  SHIMG_BASVA     Convert a shareable image index to an address
                              010A      ;+
                              010A      ; Functional Description:
                              010A      ;
                              010A      ;       This routine converts a relative shareable image number into the
                              010A      ;       absolute base address at which that shareable image is mapped. It
                              010A      ;       assumes that the base address of each shareable image has already
                              010A      ;       been stored in its associated SHL entry.
                              010A      ;
                              010A      ; Calling Sequence:
                              010A      ;
                              010A      ;       BSBW    SHIMG_BASVA
                              010A      ;
                              010A      ; Input Parameters:
                              010A      ;
                              010A      ;       R1 = Relative number of shareable image
                              010A      ;       R5 = Base address of fixup vector
                              010A      ;
                              010A      ; Implicit Input:
                              010A      ;
                              010A      ;       Contents of SHL$L_BASEVA for shareable image indexed by R1.
                              010A      ;
                              010A      ; Output Parameters:
                              010A      ;
                              010A      ;       R1 = Base address of shareable image indicated by input parameter
                              010A      ;
                              010A      ; Side Effects:
                              010A      ;
                              010A      ;       R0 is destroyed
                              010A      ;-
                              010A
                              010A      SHIMG_BASVA:
   50    18 A5     55     C1  010A              ADDL3   R5,IAF$L_SHLSTOFF(R5),R0 ; Base address of shareable image list
        7E    10 A0     9A  010F              MOVZBL  SHL$B_SHL_SIZE(R0),-(SP) ; Get size of each SHL element
50    50    51     8E     7A  0113              EMUL    (SP)+,R1,R0,R0          ; R0 points to correct SHL entry
            51     60     D0  0118              MOVL    SHL$L_BASEVA(R0),R1     ; Store associated base address
                          05  011B              RSB                             ;  and return
                          011C          .SBTTL  FIXUP_ADDRESS   Fixup .ADDRESS entries throughout the image
                          011C    ;+
                          011C    ; Functional Description:
                          011C    ;
                          011C    ;       This routine performs the .ADDRESS fixup for a specific exit vector.
                          011C    ;       Specifically, the base address of the appropriate shareable image
                          011C    ;       is added to each .ADDRESS entry in this shareable image.
                          011C    ;
                          011C    ; Calling Sequence:
                          011C    ;
                          011C    ;       BSBW    FIXUP_ADDRESS
                          011C    ;
                          011C    ; Input Parameters:
                          011C    ;
                          011C    ;       R3 = Base address of shareable image whose .ADDRESS directives
                          011C    ;               are being fixed
                          011C    ;       R4 = Address of .ADDRESS fixup area within fixup vector
                          011C    ;
                          011C    ; Implicit Input:
                          011C    ;
                          011C    ;       Contents of .ADDRESS fixup area
                          011C    ;
                          011C    ; Implicit Output:
                          011C    ;
                          011C    ;       .ADDRESS directives within this shareable image have the base addresses
                          011C    ;       of the appropriate shareable images added to them.
                          011C    ;-
                          011C
                          011C    FIXUP_ADDRESS:
          52    84    D0  011C          MOVL    (R4)+,R2                ; R2 contains a count of fixups
                11    13  011F          BEQL    20$                     ; A zero indicates the end of the G-hat data
          51    84    D0  0121          MOVL    (R4)+,R1                ; Store shareable image number in R1
                E4    10  0124          BSBB    SHIMG_BASVA             ;  and then load R1 with base address
                          0126                                          ;  of next shareable image.
    50    84    53    C1  0126    10$:  ADDL3   R3,(R4)+,R0             ; Get address of .ADDRESS directive
          60    51    C0  012A          ADDL2   R1,(R0)                 ; Bias by base address of shareable image
             F6 52    F5  012D          SOBGTR  R2,10$                  ; Do next entry
                EA    11  0130          BRB     FIXUP_ADDRESS           ; Now do next shareable image
                          0132
    50    0000'8F     3C  0132    20$:  MOVZWL  #SS$_NORMAL,R0          ; Indicate success
                      05  0137          RSB                             ; Return
```

```
                              0138            .SBTTL  FIXUP_PROT      Alter page protection to read only
                              0138      ;+
                              0138      ; Functional Description:
                              0138      ;
                              0138      ;       This routine alters the page protection of various sections within
                              0138      ;       the image to read only. These pages were initially writable so the
                              0138      ;       image activator could fixup all of the relative references. The pages
                              0138      ;       cannot be writable while the image is executing.
                              0138      ;
                              0138      ; Calling Sequence:
                              0138      ;
                              0138      ;       BSBW    FIXUP_PROT
                              0138      ;
                              0138      ; Input Parameters:
                              0138      ;
                              0138      ;       R3 = Base address of image whose pages' protection is being altered
                              0138      ;       R4 = Address of protection data within fixup vector
                              0138      ;
                              0138      ; Implicit Input:
                              0138      ;
                              0138      ;       Contents of protection data in fixup vector
                              0138      ;
                              0138      ; Implicit Output:
                              0138      ;
                              0138      ;       Pages in address ranges specified in fixup vector have their protections
                              0138      ;       changed to the protections also specified in that data area. The
                              0138      ;       protection is usually no write access for any access mode.
                              0138      ;
                              0138      ; Side Effects:
                              0138      ;
                              0138      ;       R0, R1, and R2 are destroyed
                              0138      ;-
                              0138
                              0138      FIXUP_PROT:
                56      DD    0138            PUSHL   R6                      ; Need one more register here
        5E      14      C2    013A            SUBL2   #<4*SETPRT$_NARGS>,SP   ; Set up space for argument list
                05      DD    013D            PUSHL   #SETPRT$_NARGS          ; Push argument count
        56      5E      D0    013F            MOVL    SP,R6                   ; Use R6 as argument pointer
                7E      7C    0142            CLRQ    -(SP)                   ; Initialize input address array
     04 A6      5E      D0    0144            MOVL    SP,SETPRT$_INADR(R6)    ; Put its address into argument list
        08 A6           D4    0148            CLRL    SETPRT$_RETADR(R6)      ; Not interested in this argument
     0C A6      01      D0    014B            MOVL    #PSL$C_EXEC,SETPRT$_ACMODE(R6) ; The image activator owns these page
        14 A6           D4    014F            CLRL    SETPRT$_PRVPRT(R6)      ; Not interested in this either
   50      0000'8F      3C    0152            MOVZWL  #SS$_NORMAL,R0          ; Establish initial status
        52      84      D0    0157            MOVL    (R4)+,R2                ; Get count of number of protection changes
                20      13    015A            BEQL    20$                     ; Do not even start if nothing here
   6E   84      53      C1    015C      10$:  ADDL3   R3,(R4)+,(SP)           ; Get starting address
        51      84      3C    0160            MOVZWL  (R4)+,R1                ; Ending address must be calculated
   51   51      09      78    0163            ASHL    #9,R1,R1                ;  ... from page count in image section
                51      D7    0167            DECL    R1                      ; Make byte count an inclusive count
04 AE   6E      51      C1    0169            ADDL3   R1,(SP),4(SP)           ; Put ending address in second longword
     10 A6      84      3C    016E            MOVZWL  (R4)+,SETPRT$_PROT(R6)  ; Get new protection from fixup vector
00000000'GF     66      FA    0172            CALLG   (R6),G^SYS$SETPRT       ; Call the system service
                              0179                                            ; Ignore errors
        E0 52           F5    0179            SOBGTR  R2,10$                  ; Go get next image section
                              017C
        5E      20      C0    017C      20$:  ADDL2   #<8+4+<4*SETPRT$_NARGS>>,SP ;Reset stack pointer,
56 8ED0  017F   598         POPL    R6                      ;  restore that extra register,
     05  0182   599         RSB                             ;  and return
```

```
                          0183       .SBTTL  IMG$PRVSHRIMG   Fixup Routine for Privileged Shareable Images
                          0183  ;+
                          0183  ; Functional Description:
                          0183  ;
                          0183  ;      This routine checks that a privileged shareable image has no
                          0183  ;      outbound calls. For images passing this test, remaining
                          0183  ;      .ADDRESS fixups are performed.
                          0183  ;
                          0183  ; Calling Sequence:
                          0183  ;
                          0183  ;      BSBW    IMG$PRVSHRIMG
                          0183  ;
                          0183  ; Input Parameters:
                          0183  ;
                          0183  ;      R0      Address of fixup vector
                          0183  ;      R1      Base address of privileged shareable image currently
                          0183  ;              being mapped
                          0183  ;
                          0183  ; Implicit Output:
                          0183  ;
                          0183  ;      If the fixup vector indicates no outbound calls, the base address
                          0183  ;      of the privileged shareable image is stored in the fixup vector
                          0183  ;      and the .ADDRESS fixups are performed.
                          0183  ;
                          0183  ; Side Effects:
                          0183  ;
                          0183  ;      R0 and R1 are destroyed
                          0183  ;
                          0183  ; Completion Codes:
                          0183  ;
                          0183  ;      SS$_NORMAL      Fixups were completed for privileged shareable image
                          0183  ;
                          0183  ;      SS$_NOSHRIMG    Shareable image has outbound calls
                          0183  ;-
                          0183
                          0183  IMG$PRVSHRIMG::
               3C    BB   0183         PUSHR   #^M<R2,R3,R4,R5>        ; Save some registers
          55   50    D0   0185         MOVL    R0,R5                   ; Store fixup vector address in R5
50   1C A5     01    C3   0188         SUBL3   #1,IAF$L_SHRIMGCNT(R5),R0       ; Is shareable imagc count 1?
               2B    12   018D         BNEQ    30$                     ; If not, report error
        0C A5        D5   018F         TSTL    IAF$L_G_FIXOFF(R5)      ; Also report error if G^ fixup data
               26    12   0192         BNEQ    30$
          53   51    D0   0194         MOVL    R1,R3                   ; Store base address of image in R3
50   18 A5     55    C1   0197         ADDL3   R5,IAF$L_SHLSTOFF(R5),R0        ; Also store base address in
          60   51    D0   019C         MOVL    R1,SHL$L_BASEVA(R0)     ;  SHL entry for SHIMG_BASVA
     54    10 A5     D0   019F         MOVL    IAF$L_DOTADROFF(R5),R4  ; Any .ADDRESS fixups?
               06    13   01A3         BEQL    10$                     ; Branch if none
     54        55    C0   01A5         ADDL2   R5,R4                   ; Convert R4 offset to address
             FF71    30   01A8         BSBW    FIXUP_ADDRESS           ; Fixup all .ADDRESS data
     54    14 A5     D0   01AB  10$:   MOVL    IAF$L_CHGPRTOFF(R5),R4  ; Get offset to protection data
               06    13   01AF         BEQL    20$                     ; All done if none
     54        55    C0   01B1         ADDL2   R5,R4                   ; Make R4 an address
             FF81    30   01B4         BSBW    FIXUP_PROT              ; Change page protection
               3C    BA   01B7  20$:   POPR    #^M<R2,R3,R4,R5>        ; Restore registers
               05         01B9         RSB                             ;  and return
                          01BA
  50   0000'8F       3C   01BA  30$:   MOVZWL  #SS$_NOSHRIMG,R0        ; No outbound calls allowed
```

```
                    F6   11  01BF    658          BRB      20$                          ; Return error status
```

```
                          01C1         .SBTTL  INISHRIMG - Look for and Call Shareable Image Initialization Code
                          01C1  ;+
                          01C1  ; Functional Description:
                          01C1  ;
                          01C1  ;      This routine searches the shareable image list for images that have
                          01C1  ;      included initialization code.
                          01C1  ;
                          01C1  ; Calling Sequence:
                          01C1  ;
                          01C1  ;      BSBW    INISHRIMG
                          01C1  ;
                          01C1  ; Input Parameters:
                          01C1  ;
                          01C1  ;      none
                          01C1  ;
                          01C1  ; Implicit Input:
                          01C1  ;
                          01C1  ;      IAC$GL_IMAGE_LIST - List of ICBs describing shareable images that
                          01C1  ;              are currently mapped.
                          01C1  ;      IAC$GL_FIRST_ICB - Address of ICB representing main image in the
                          01C1  ;              most recent image activation.
                          01C1  ;
                          01C1  ; Implicit Output:
                          01C1  ;
                          01C1  ;      If there are any images with ICBs containing shareable image
                          01C1  ;      initialization code, these procedures are called at their entry
                          01C1  ;      points. Note that the ICB list is traversed backwards.
                          01C1  ;
                          01C1  ; Side Effects:
                          01C1  ;
                          01C1  ;      R0 and R1 are destroyed
                          01C1  ;
                          01C1  ; Completion Codes:
                          01C1  ;
                          01C1  ;      none
                          01C1  ;-
                          01C1
                          01C1  INISHRIMG:
         7E   52     7D   01C1         MOVQ    R2,-(SP)                     ; Save some registers
52   00000000'GF     DE   01C4         MOVAL   G^IAC$GL_IMAGE_LIST,R2       ; Get the listhead address
53   00000000'GF     D0   01CB         MOVL    G^IAC$GL_FIRST_ICB,R3        ; This is the stopper
                          01D2
    52     04 A2     D0   01D2  10$:   MOVL    ICB$L_BLINK(R2),R2           ; Get the next ICB
              05     E1   01D6         BBC     #ICB$V_INITIALIZE,-          ; Does this image need to be called?
       09  10 A2          01D8                 ICB$L_FLAGS(R2),20$          ;  Branch if no initialization routine
           60 A2     C1   01DB         ADDL3   ICB$L_INITIALIZE(R2),-       ; Form the address of the entry point
    51     5C A2          01DE                 ICB$L_BASE_ADDRESS(R2),R1
           61 00     FB   01E1         CALLS   #0,(R1)                      ; Call the routine
           53 52     D1   01E4  20$:   CMPL    R2,R3                        ; Is this the end of the line?
              E9     12   01E7         BNEQ    10$                          ; Back to the top is there's more
           52 8E     7D   01E9         MOVQ    (SP)+,R2                     ; Restore R2 and R3
                     05   01EC         RSB                                  ; All done. Return to caller.
                          01ED
                          01ED         .END
```

```
$$ARGS                          = 00000005
$$T1                            = 00000000
CTL$GL_FIXUPLNK                   ********   X     02
EXE$IMGFIX                        00000000 RG      02
FIXUP_ADDRESS                     0000011C R       02
FIXUP_G_HAT                       000000F2 R       02
FIXUP_PROT                        00000138 R       02
GET_BASE_ADDRESSES                00000039 R       02
IAC$GL_FIRST_ICB                  ********   X     02
IAC$GL_IMAGCTX                    ********   X     02
IAC$GL_IMAGE_LIST                 ********   X     02
IAC$M_SETVECTOR                 = 00200000
IAF$L_CHGPRTOFF                 = 00000014
IAF$L_DOTADROFF                 = 00000010
IAF$L_FIXUPLNK                  = 00000004
IAF$L_G_FIXOFF                  = 0000000C
IAF$L_SHLSTOFF                  = 00000018
IAF$L_SHRIMGCNT                 = 0000001C
ICB$L_BASE_ADDRESS              = 0000005C
ICB$L_BLINK                     = 00000004
ICB$L_FLAGS                     = 00000010
ICB$L_FLINK                     = 00000000
ICB$L_INITIALIZE                = 00000060
ICB$T_IMAGE_NAME                = 00000014
ICB$V_INITIALIZE                = 00000005
IMAGCTX$V_INITIALIZE            = 00000011
IMAGCTX$V_SETVECTOR             = 00000010
IMG$IS_IT_MAPPED                  00000073 RG      02
IMG$PRVSHRIMG                     00000183 RG      02
IMG$_IMAGE_NOT_FOUND            = 084D8962
INISHRIMG                         000001C1 R       02
PROCESS_FIXUP_LIST                000000B6 R       02
PSL$C_EXEC                      = 00000001
SETPRT$_ACMODE                  = 0000000C
SETPRT$_INADR                   = 00000004
SETPRT$_NARGS                   = 00000005
SETPRT$_PROT                    = 00000010
SETPRT$_PRVPRT                  = 00000014
SETPRT$_RETADR                  = 00000008
SHIMG_BASVA                       0000010A R       02
SHL$B_SHL_SIZE                  = 00000010
SHL$L_BASEVA                    = 00000000
SHL$T_IMGNAM                    = 00000018
SS$_NORMAL                        ********   X     02
SS$_NOSHRIMG                      ********   X     02
SYS$IMGACT                        ********  GX     02
SYS$SETPRT                        ********   X     02

                                                   +----------------+
                                                   ! Psect synopsis !
                                                   +----------------+

PSECT name                      Allocation          PSECT No.  Attributes
----------                      ----------          ---------  ----------
.  ABS  .                       00000000  (    0.)  00 (  0.)  NOPIC   USR   CON   ABS   LCL NOSHR NOEXE NORD  NOWRT NOVEC BYTE
$ABS$                           00000000  (    0.)  01 (  1.)  NOPIC   USR   CON   ABS   LCL NOSHR   EXE   RD    WRT NOVEC BYTE
YF$$SYSIMGACT                   000001ED  (  493.)  02 (  2.)  NOPIC   USR   CON   REL   LCL NOSHR   EXE   RD    WRT NOVEC BYTE
```

```
                                        +--------------------------+
                                        ! Performance indicators !
                                        +--------------------------+

Phase                    Page faults    CPU Time       Elapsed Time
-----                    -----------    --------       ------------
Initialization                   34    00:00:00.07    00:00:00.40
Command processing              136    00:00:00.73    00:00:03.65
Pass 1                          192    00:00:04.03    00:00:10.67
Symbol table sort                 0    00:00:00.26    00:00:00.34
Pass 2                          133    00:00:01.52    00:00:03.66
Symbol table output               7    00:00:00.05    00:00:00.05
Psect synopsis output             2    00:00:00.03    00:00:00.04
Cross-reference output            0    00:00:00.00    00:00:00.00
Assembler run totals            506    00:00:06.69    00:00:18.82

The working set limit was 1500 pages.
21961 bytes (43 pages) of virtual memory were used to buffer the intermediate code.
There were 20 pages of symbol table space allocated to hold 218 non-local and 25 local symbols.
713 source lines were read in Pass 1, producing 14 object records in Pass 2.
20 pages of virtual memory were used to define 19 macros.

                                       +----------------------------+
                                       ! Macro library statistics !
                                       +----------------------------+

Macro library name                        Macros defined
------------------                        --------------
_$255$DUA28:[SYS.OBJ]IMGACT.MLB;1                  3
_$255$DUA28:[SYS.OBJ]LIB.MLB;1                     2
_$255$DUA28:[SYSLIB]STARLET.MLB;2                 11
TOTALS (all libraries)                            16

329 GETS were required to define 16 macros.

There were no errors, warnings or information messages.

MACRO/LIS=LIS$:SYSIMGFIX/OBJ=OBJ$:SYSIMGFIX MSRC$:SYSIMGFIX/UPDATE=(ENH$:SYSIMGFIX)+EXECML$/LIB+LIB$:IMGACT/LIB
```

0385 AH-BT13A-SE
VAX/VMS V4.0

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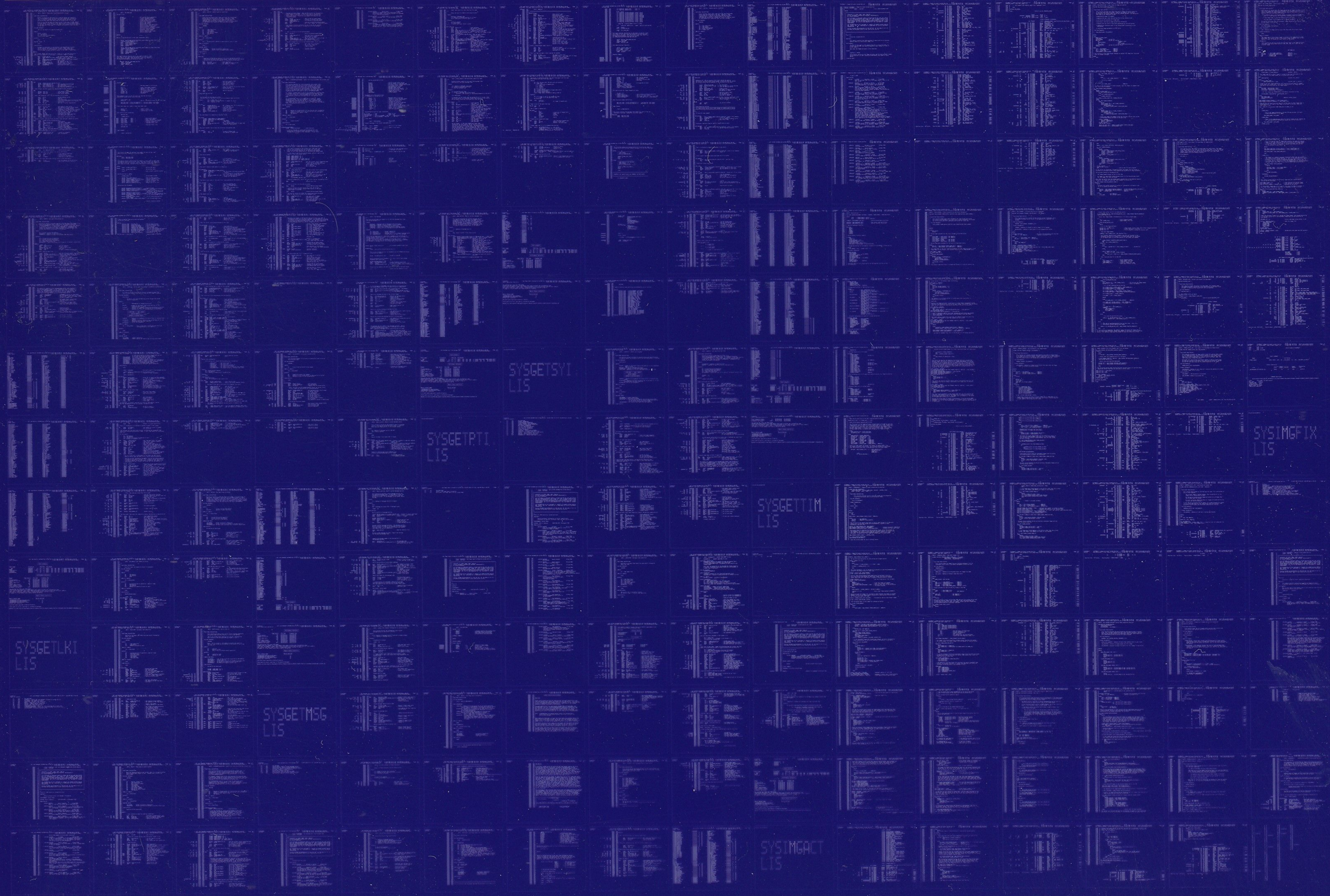

0386 AH-BT13A-SE
VAX/VMS V4.0

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